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IRRIGATION IN ALBERTA

Irrigation is an age-old method of bringing water to the land. In China and ancient Egypt its benefits were early recognized, and in more recent times its use in North America has improved the farm outlook and allowed introduction of crops not previously grown.

Not until the turn of the century was irrigation given serious thought in Alberta. Before that, small-scale individual irrigation had been practised, but only in more recent times has it been used extensively.

Irrigation requires both money and labour, and when there is a chance of sufficient rainfall, farmers hesitate to incur the expense required. This was the story of early irrigation attempts in Alberta. With wheat the chief crop in those early days, increased yield as a result of irrigation scarcely paid for the extra cost and effort. This was particularly true in years like 1906, 1911, and 1916 in each of which more than 20 inches of precipitation were recorded at Lethbridge.

From 1903 to 1913 sugar beet growing was encouraged, but it was not until revival of the industry in 1925 followed by establishment of commercial canning that irrigation began to come into its own. Expenditures by the Canada and Alberta Departments of Agriculture and research by the irrigation and horticulture sections of the Research Station at Lethbridge are paving the way for more specialized crops, improved water use, and greatly increased production. Active also in the search for better adapted fruits and vegetables is the Brooks Horticulture Research Centre.

In Western Canada, ownership of all surface water is vested in the Crown. The right to its use cannot become private property. Use of this water is regulated by licenses from the Crown, and these are subject to cancellation for non-use or misuse. Water for irrigation has preference over that for water power or recreation. Domestic, municipal or industrial use, however, has preference over irrigation.

Sources of Water

There are at present 780,000 irrigated acres in Alberta. Main contributing rivers are the Bow, Belly, St. Mary, Highwood, Waterton and Old Man, all of which are tributaries of the South Saskatchewan. Of these the Bow River supplies water for over 355,000 acres and the St. Mary River for almost 250,000 acres. We are fortunate in that the peak run-off from the melting snow of the Rockies coincides closely with the greater demand for irrigation water

Since the rivers we use in irrigation flow beyond our borders and some of them rise in the United States, it can be seen that our neighbours to both the south and the east must be considered. The water supply for the St. Mary River Dam, for instance, is affected by the use of water by the United States, who divert from the St. Mary River to the Milk River on the south side of the 49th parallel. This water flows down the Milk River channel and is subsequently re-diverted in the vicinity of Havre, Montana. Apportionment of the Milk and St. Mary Rivers is governed by treaty.

With the flow of the Saskatchewan River through the Prairie Provinces, Saskatchewan particularly is concerned with the amount of water used upstream. To see that each province receives its fair share, the Prairie Provinces Water Board was established in 1950. Each province has a representative on the Board and the Dominion has two representatives. Although the Board is an advisory organization it has the power to make allocation of water after approval by the provinces.

Land Preparation

Since an evenly distributed and readily controlled flow of water is desirable for irrigation, land levelling and water control structures are first considerations. This work is done by trained men, and service in layout and design for irrigation practices is available from Alberta Agriculture.

Land levelling has several benefits. Water can

be applied evenly to the soil, resulting in more uniform and higher crop yields. The water is continuously under control, which reduces waste of both water and land. Controlled application reduces water erosion and waterlogging. The labour requirement is reduced and irrigation efficiency is increased.

For successful irrigation, good drainage is essential, and the subsoils of the irrigated lands in Alberta allow some underdrainage. There are exceptions. Relatively impervious areas do occur, but under root penetration and cultural treatment they have developed into fairly good irrigated soils. The heavy clay soils of some districts are inadequately drained and present local problems.

Irrigation Methods

All methods of irrigating have an objective the uniform and efficient application of water to crop land. The common method is to convey the irrigation water in open ditches by gravity to the farm land, and allow it to flood over a field. From this, methods increase in complexity to the closed pipe systems that convey the water to the fields in pressure pipes and release it over the land through sprinkler nozzles or similar devices.

The best methods provide maximum coverage to a suitable depth with minimum of waste, effort and expense. The roots of most crop plants draw moisture and nutrients from the upper few feet of soil. This layer of soil acts as a storage reservoir for water and the purpose of irrigation is to keep this reservoir well supplied. The soil must not be kept saturated, however, or warmth and aeration will be lacking and plant growth retarded.

Plant Use of Moisture

Plants use the moisture from the top foot of soil first, followed by use from the second, third and succeeding foot depths. The object of irrigation is to replenish the water that has been used, by applying enough to connect with the moisture in the lower depths.

If more than this is used waste occurs; and excessive irrigation wastes not only water but leaches water-soluble nutrients beyond the reach of plants.

The area of soil that contains the plant roots is about 2 feet for shallow-rooted crops, 4 feet for most normal rooted crops and as much as 6 feet for the roots of alfalfa. Plants take over 40 per cent of their moisture from the upper quarter of the root zone, about 30 per cent from the next quarter, 20 per cent from the third quarter and 10 per cent from the fourth.

Management

Irrigation farming requires higher capital investment per acre and higher operating costs than dry land farming. More machinery is needed and additional labour is required to more intensively cultivate, irrigate and harvest crops on irrigated farms and to care for the livestock that go with them.

Careful management is also demanded. When a soil receives all the water it needs, a more complicated balance exists among soil, fertility, water and plants. Soil building crops (legumes and grasses) must be included in the rotation and special attention given to manure and fertilizers.

The need for higher returns per acre from the smaller acreages under irrigation make necessary the production of specialized crops where these can be grown and sold. This is combined with legumes and forage crops to maintain fertility, growing feed grains for livestock, and keeping livestock to consume these crops or their by-products.

Alfalfa

Where conditions are favourable, alfalfa usually occupies a large percentage of land seeded down for hay production. Alfalfa is a legume. This group of plants have small nodules on their roots, in which are bacteria that take nitrogen from the air and convert it to forms usable by plants. The alfalfa plant has two-thirds of its nitrogen in the tops and one-third in the roots. Thus, the soil may be enriched if the

green top growth is turned under, but not if the crop is continually cut for hay and no manure returned.

Usually, the physical condition of the soil is improved by growing alfalfa. The extensive root system penetrates deeply, improving aeration of the soil and promoting growth of beneficial bacteria. The decaying roots add to the supply of organic acids in the soil, which in turn makes available to the plants the plant food already in the soil.

Sugar Beets

Sugar beets have been one of the most profitable crops grown under irrigation in Alberta, and the acreage has increased from 5,000 in 1925 to over 10,000 in 1970. This crop responds better than most others to highly fertile, well prepared land. The best crops in Alberta are grown on fertile, well-drained land of gentle slope that allows for uniform and thorough irrigation.

The sugar beet harvest in Alberta usually begins towards the end of September so that it may be completed by the end of October. This provides a maximum growing season of only five months, which is considerably shorter than that available in many irrigated areas in the United States. Since the beets are growing rapidly and increasing greatly in sugar content toward the end of this short growing season, it is in the interest of maximum production to delay the harvest as long as possible. Gains of more than 30 per cent in acre production of sugar have been measured in beets dug on October 23 compared with beets dug on September 29.

Beet pulp and beet tops are important by-products of sugar beet processing and these have contributed greatly toward the establishment of a highly successful livestock finishing industry in the area. In turn, manure from the feedlots is returned to the soil to improve fertility.

Potatoes

Potatoes do well as an irrigated crop. Careful

attention to moisture supply, from the time the tubers begin to form until harvest, results in a product of high quality. In addition to cash returns, potatoes have other important advantages as an irrigated crop. A well cultivated potato field provides excellent weed control. Potatoes are a good preceding crop; sugar beets, cereal grains, and most other crops produce well following potatoes. Cull potatoes are useful in a livestock feeding program. Because the potato crop usually is planted later than other special crops, this work can be done when pressure of the seeding rush is diminishing.

Other Crops

Among other important irrigated crops are irrigated pastures and canning crops like peas, beans, pumpkins and corn. Also grown commercially are carrots, table beets, cabbage, cucumbers, muskmelons, cantaloupes, strawberries and raspberries. On irrigated farms, cereals are more often grown for feed than for sale. Canning corn is an important crop on the irrigated lands of Alberta and canning peas fit well into the irrigated crop rotation.

Crop rotation is a necessary part of irrigation farming. Different crops grown in succession help to conserve the soil and to control plant diseases, weeds and insect pests. Included in the rotation may be shallow and deep rooted crops, sod crops and intertilled crops. Crop rotation distributes risk, allows for more accurate forecasting of annual returns and provides for fuller use of available soil fertility.

Problems

A problem that often accompanies irrigation is the build-up of soluble salts in the soil. These are principally sodium, calcium, and magnesium salts. They are always present, but movement of the water concentrates them. Without satisfactory drainage and good irrigation practice, accumulation of these salts may occur to the detriment of crops grown on the land.

Fortunately, water for the major irrigation areas of Alberta is low in salt content, coming as it does

from the mountain streams. Surveys have also shown that under favourable conditions, most of the salts originally present in many soils developed for irrigation in Alberta have been moved by the irrigation water to depths below the soil root zones.

Salinity and water-logging have occurred, however, as a result of inadequate drainage. Another cause is high ground water levels resulting from over-irrigation or seepage from canals and ditches. To reduce this problem, care is required in selection of lands, location and construction of canals, and provision of adequate drainage. Also needed are a knowledge of crop water requirements, good irrigation practices, and suitable land preparation.

More detailed information is available from Alberta Agriculture at Edmonton and Lethbridge.